

Laser Power Meter ADM-1000

Operating Instructions



Issue Notes

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Introduction

The ADM-1000 is an advanced hand-held or bench Optical Power Meter. It is used in conjunction with one of a range of detector heads for measuring and displaying optical power and waveforms.

The ADM-1000 may only be used with compatible detector heads. The range of heads available includes photodiode and thermal types covering a range of sensitivities and wavelengths.

Contact Laser 2000 UK Ltd for details on available detector heads.

Power Sources

The ADM-1000 may be powered from:
Internal battery pack;
DC power supply;
USB.

DC Power Supply

A DC power supply is included with the ADM-1000. The lead is connected to the 6VDC socket on the end of the ADM-1000, the power supply is then plugged into the mains. The ADM-1000 will operate from the power supply regardless of whether the battery pack is fitted or not.

The use of unapproved power sources should be avoided to prevent damage to the power meter.

If the battery pack is fitted to the ADM-1000, the power supply will charge the battery as well as operate the ADM-1000.

Battery Pack

The supplied NiMH battery pack fits to the rear of the unit. It is released by pressing the tab at the back, and slid off.

The battery pack may be charged when it is attached to the ADM-1000 by plugging in the DC power supply into the 6VDC socket on the ADM-1000. So long as the power supply is connected and operating, the battery is charged even if the ADM-1000 is switched off via its keypad.



It typically takes 8 hours to fully charge the battery. To maximise the life of the battery pack, avoid charging it for more than 12 hours.

New battery packs may only have a small amount of charge in them and will require charging before use. Note that new battery packs or packs which haven't been used for a long time will require several charge/discharge cycles before they reach full capacity.

The ADM-1000 will typically run for 5 hours or more on a good, fully charged battery pack. A longer operating time will be achieved if the backlight is used less.

Additional battery packs are available from Laser 2000. Laser 2000 can also supply an optional fast charger which can recharge the battery pack in about 1 hour.

USB

The ADM-1000 will operate from the power available from a USB port. Refer to the section 'PC Installation'. Note that in this mode the battery is not charged.

Switching On

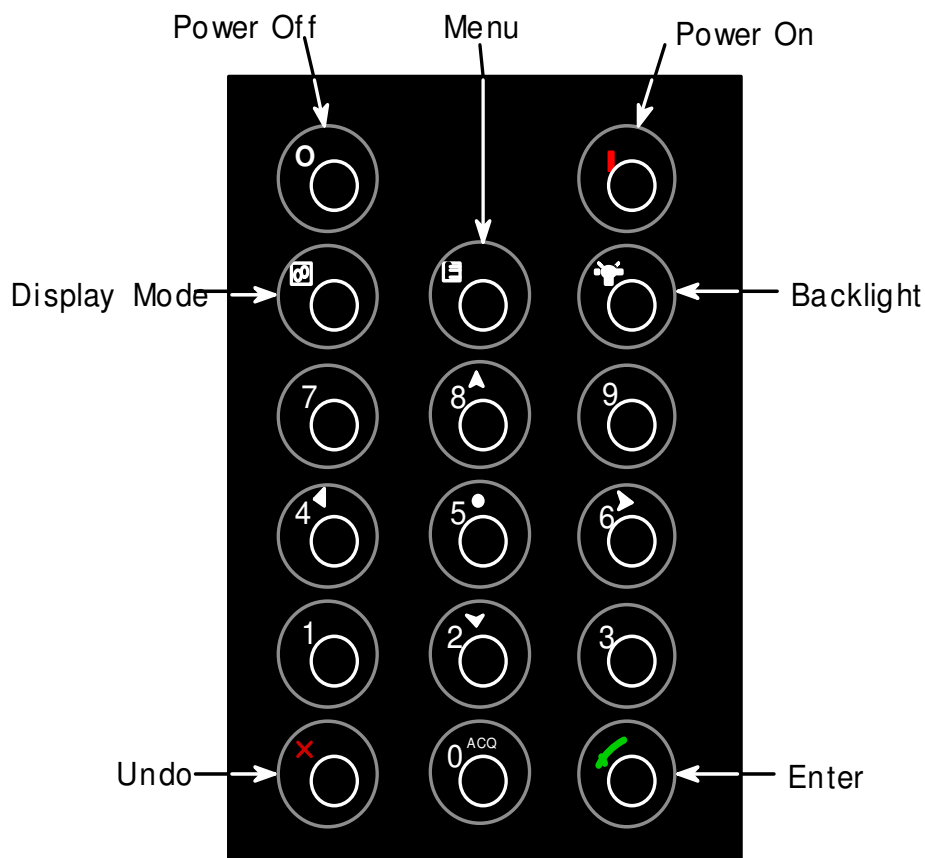
To turn the unit on, press and hold the 'I' button at the top of the keypad (refer to the keypad layout diagram) for 1 second until the unit beeps.

The meter will set itself to the last used settings.

If powering the unit from a USB port, the unit will turn itself on as soon as the port is enabled.

To turn the unit off, press and hold the 'O' button at the top of the keypad until the unit turns off.

If the ADM-1000 is connected to a USB port, unplug the USB lead to turn the unit off.



Keypad Layout
Diagram 1

Display Mode Summary

The ADM-1000 can operate in digital (numerical) or graphical (waveform) display mode.

Digital Display Features

Manual or auto ranging numerical display.

This display shows the measured value in numerals with units.

A bargraph trend indicator beneath the digits shows the current value relative to the full scale on the selected range.

Depending on the head type, other information may be displayed such as wavelength and detector temperature.

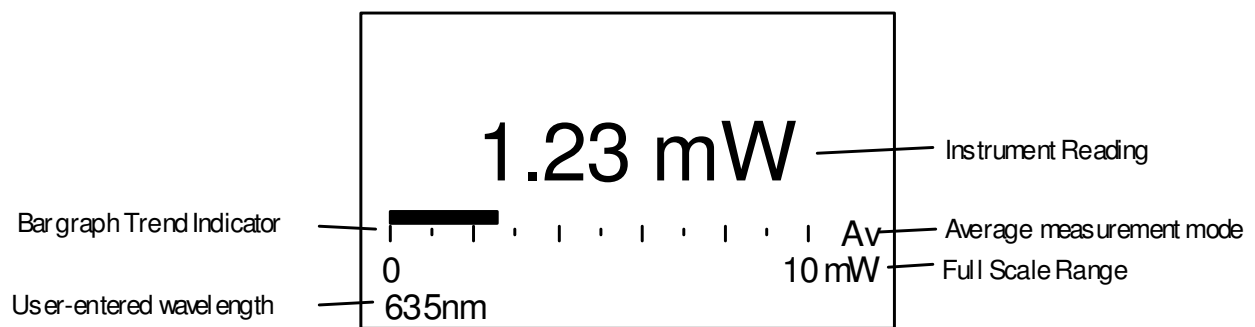


Diagram 2: Digital Display

Graphical Display Features

Dot matrix graphical display of actual value over time with indications of X (time) and Y (magnitude) scales and Head scaling factor.

User operable cursors may be turned on to make measurements on the waveform.

In either mode, pressing the Menu button (see the keypad diagram) will result in a list of options being displayed, the user being able to select one as desired.



Operation

Refer to the keypad diagram to identify the keys.

Connect the ADM-1000 to the head using the supplied cable, and switch the unit on by holding the 'I' button at the top of the keypad until the unit beeps. The unit sets itself to the last used settings.

If a photodiode head is connected, the wavelength of incident radiation will need to be entered to get the correct reading. See the section 'Wavelength' below.

Display Mode

To switch between digital and graphical display modes, press the Display Mode button. The last used settings are used in each mode.

Range

To set the full scale range, press the up arrow (8) to increase sensitivity or down arrow (2) to reduce it.

Alternatively press Menu, scroll down to Range using the up arrow (8) or down arrow (2) buttons, press Enter (green tick), scroll down the list and press Enter to select the desired range or Cancel (red 'X') to revert to the original display.

Note that the range setting on the digital display is independent of the range set on the graphical display, and more ranges may be available on the graphical display.

Auto-Range

The ADM-1000 has an auto-range capability in the digital display mode. In this mode, the meter will automatically switch to a higher (less sensitive) range when the measurement exceeds the present range.

Similarly the meter will switch to a more sensitive range when the measurement is less than about 9% of full scale.

To turn on the auto-range function, press Menu, scroll down to Range, press Enter, select AUTO and press Enter.

To turn off the auto-range function, press Menu, scroll down to Range, press Enter, scroll down to select the desired range and press Enter.



Note that auto-range facility is not provided in the graphical display mode.

Wavelength

Photodiode heads do not have a linear response and the wavelength of the incident radiation must be entered by the operator for meaningful measurements to be made. The wavelength response of each detector head is stored in the head at calibration and the correction factor is automatically applied once the wavelength has been entered.

To enter the wavelength of incident radiation, press Menu, scroll to Wavelength using the up arrow (8) or down arrow (2) buttons, press Enter and use the numeric keypad to type in the wavelength in nanometres (nm). Press Enter when done. Press Cancel instead of Enter and the data entry is removed ready for re-entry. Press Cancel again and the display reverts to the main display.

Note that for thermal detector heads the wavelength is not required to be known and this menu option is not available.

Peak/Average Measurement

In peak measurement mode, the display indicates the maximum value that was reached in every approximately 0.5-second period.

In average measurement mode, the optical signal is averaged with a 200ms time constant and will give a useful average (mean) value for steady (CW) sources or pulse frequencies at or above 50Hz.

To set peak/average measurement in digital display mode, press menu, scroll to Measure Mode using the up arrow (8) or down arrow (2) buttons, press enter, scroll down the list to select the required measurement mode and press enter.

The possibility of having a variable averaging time constant is being reviewed. It is envisaged that this would offer time constants from 100ms to 10s, so that the display can be set to respond quickly with a short time constant or give a good average for slow or noisy signals with a long time constant.

In waveform display mode, the actual instantaneous level is displayed and there is no option to set peak or average mode.

Zero Offset

For accurate measurements it may be necessary to set the point at which zero light is displayed. This is achieved by blocking off all light to the detector and then zeroing the meter.

To set the zero point, press menu, scroll down to zero, press enter. Message, "Set zero light level?" appears. Ensure that the detector optical input port is totally blocked by an opaque object which is at room temperature, or all light is prevented from entering the detector by some means. To avoid damage or injury ensure any powerful optical source is switched off. Do not use a finger as some detectors will detect the infra-red from the finger. When ready, press Enter. The zero value on the meter is now set to the level corresponding to darkness.

The display then returns to the main display and the obstruction at the detector port can now be removed.

Backlight

To turn the backlight on or off, press the backlight button (refer to the keypad diagram).

To set the backlight brightness, press menu, scroll down to Display, press enter. Backlight is already selected, so press Enter. The message 'Backlight on' and the current brightness percentage appears. Use the up arrow (8) and down arrow(2) buttons to adjust the brightness from 10% (dim) to 100% (bright). Press Enter when done. The display returns to the main display.

Note that if running the unit from the battery pack, the battery life will be reduced depending on how much the backlight is used and how brightly it is set.

Display Contrast

To set the display contrast, press Menu, scroll down to Display, press Enter. Scroll down to Contrast, press Enter. The current contrast level is displayed. Use the up/down buttons to change the contrast for best viewing. Press enter when done. The display returns to main display.

Graphical Mode Functions

In graphical display mode there are two modes which enable quick selection of the most commonly used commands. The mode is indicated by the label 'RNG' or 'TRG' in the bottom right corner of the display, and the mode can be switched between the two by pressing the '5' button. The 'RNG' mode allows quick selection of the operating ranges, the 'TRG' mode allows quick adjustment of the trigger settings.

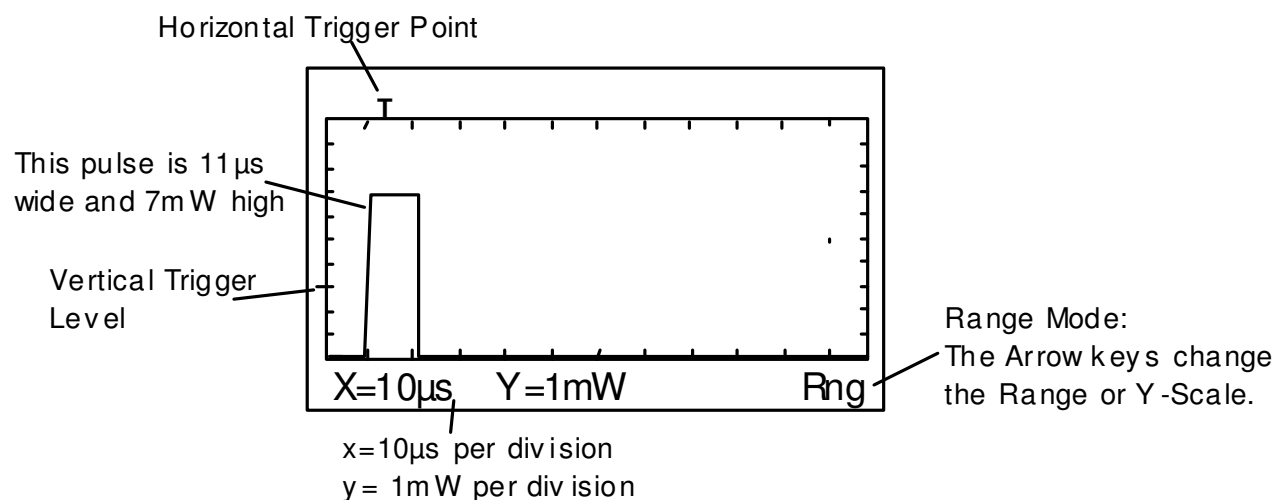


Diagram 3: Graphical Display

In Range mode (RNG):

Timebase (Horizontal Scale) setting

Press the left arrow (4) button to reduce the timebase. Press the right arrow button (6) to increase the timebase.

The timebase can also be set by pressing Menu, scrolling down to X Scale and pressing Enter to select, then choosing the desired timebase setting.

The available timebases are dictated by the type of head connected.

The chosen setting is displayed on the screen and represents the time between each division on the horizontal axis.



Start Acquisition

To stop and start the acquisition, press the ACQ (0) button. If cursor calculations are enabled, the cursors and current calculation will be displayed when the acquisition is stopped.

Rolling Display

At slow timebases the trace will travel across the display until it reaches the right hand side, whereupon the waveform will start scrolling to the left as new data is added to the right (Stripchart mode). Press the Acquire button (0) to manually start/stop the stripchart display.

Y-scale (Range) setting

Press the up arrow (8) button to increase the sensitivity (make the waveform taller). Press the down arrow (2) button to decrease the sensitivity.

The Y-Scale can also be set by pressing Menu, scrolling down to Y Scale and pressing Enter to select, then choosing the desired sensitivity.

The chosen setting is displayed on the screen and represents the magnitude per division on the vertical axis.

The available ranges are dictated by the type of head connected.

Trigger setting

Trigger Level

In order that the display always starts at the same point in the waveform, a trigger point is set to tell the meter when to start drawing the waveform. For all but the very slow timebases it will be necessary to set the vertical trigger level correctly to produce a stable display.

When the instrument is not triggered, 'No trig' is shown at the top of the display. Once the trigger has been correctly set and the instrument has 'locked on' to the waveform, 'Trig' is shown.

Horizontal trigger adjustment is also provided so that the display can be moved to the left or right. The meter is able to display information that occurred before the trigger point as well as after.

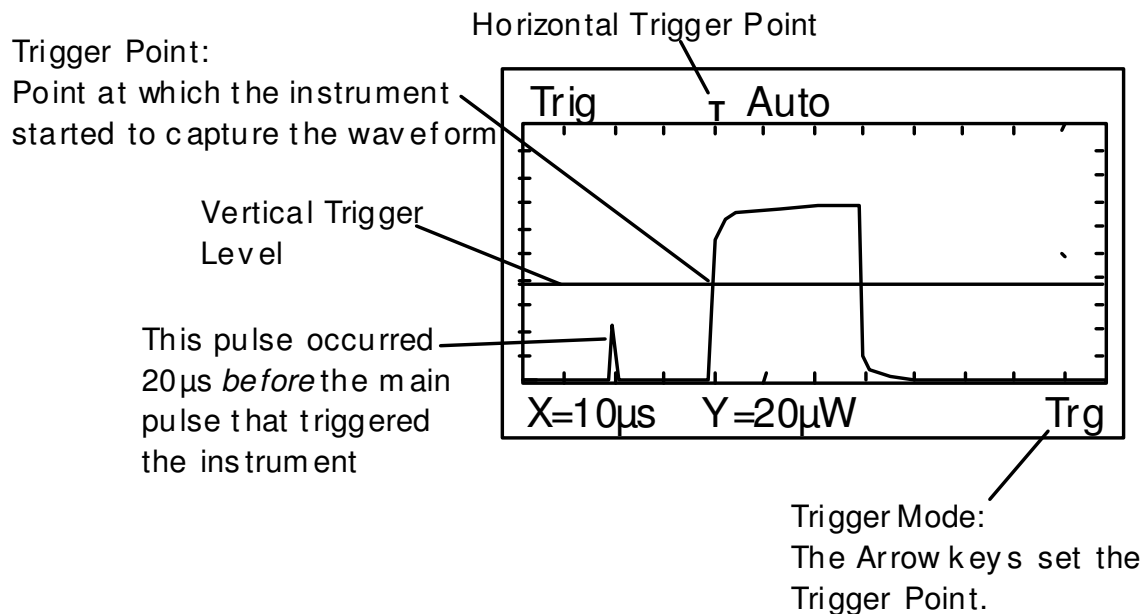


Diagram 4: Trigger Operation

Set 'TRG' mode:

Press 5 so that TRG is displayed in the bottom corner of the display. Use the up and down keys to adjust the vertical trigger point until a stable waveform is achieved and 'Trig' is shown at the top of the display. The trigger level is shown as a horizontal line across the graph.

If the y scale is set from a decade setting to a more sensitive '5' or '2' setting, the trigger point will hold the same absolute value to ensure that the same actual trigger point is maintained. This may mean that it will disappear off the top of the screen. If you want to relocate it into the visible area, press the green tick button and the trigger point will be reset in the lower half of the screen.

Use the left and right buttons to move the trigger point horizontally. The horizontal trigger point is shown by a small 'T' at the top of the graph.

Press 5 to turn off the trigger mode and the horizontal trigger level line is no longer shown. However the vertical trigger point is indicated by a small index mark to the left of the grid.

Alternatively, trigger adjustments can be made through the menus.



Press the Menu button. Scroll down to the Trig Level option and press Enter. TRIG is displayed with the current trigger level alongside the waveform display. Use the up and down arrow buttons to increase and decrease the trigger level until the desired value is shown, or until the waveform triggers. Press Enter to exit the trigger level setting function.

Trigger Slope

Press the Menu button. Scroll down to the Trig Slope option and press Enter. Use the up and down arrow buttons to switch between positive (rising edge) and negative (falling edge) slope. Press Enter to leave the trigger slope setting function.

Trigger Mode

Press the Menu button. Scroll down to the Trig Mode option and press Enter. Use the up and down arrow buttons to select between Auto, Normal and Manual.

The trigger mode is shown at the top centre of the waveform display.

In *Auto* mode, if no valid trigger occurs after a period of time, the display will show whatever signal is currently being seen and the words 'No trig' are shown at the top of the display. If regular pulses are detected and the trigger level is set correctly, the display will lock onto the pulse and the word 'Trig' is shown at the top of the display.

When the timebase is set to a slow setting it may take a short while to collect the data and display it, and 'wait' is shown at the top of the screen while the data is being collected prior to display.

In *Normal* mode, if no valid triggers occur no waveform is displayed and 'No trig' is shown at the top of the display. Once the meter has triggered and displayed a waveform, the captured waveform is kept on the display until the next trigger occurs. This gives the user the ability to see and measure short pulses that might occur infrequently.

In *Manual* Mode, a waveform is only displayed when the ACQUIRE button is pressed, see 'Start Acquisition'.

Cursor Function

The ADM-1000 has a cursor function which enables various calculations to be made on displayed waveforms.

In waveform display mode, press ACQ (0) to stop the acquisition. Two small crosses are displayed on the waveform, one of which is flashing. The meter can perform various calculations based on the positions of the cursors including:

Delta t Time Difference between the cursors. This can be used to determine period, pulse width etc.

Delta P Power difference between the cursors. This is used for measuring pulse amplitudes or amplitude differences.

Using both Delta t and Delta P, the pulse risetime can be determined.

1/Delta t This is used to measure frequency (PRF) in Hertz. The display should be arranged so that preferably two pulses can be seen, and the cursors should then be set to the same point on each of the two adjacent pulses.

Average Power The average power between the cursors is calculated. This can be used to determine the average power in a certain period of time, e.g. during a burst of pulses.

Pulse Energy The energy within a single pulse, in Joules. The display is arranged to show one pulse as large as possible, and the cursors set one either side of the pulse. The energy in the pulse is displayed.

Use the 5 button to select the cross to be moved, one of the crosses is flashing to show which is selected. Use the left and right arrow buttons to move it. Press 5 to select the other.

The calculated value is shown at the top of the display. To change the type of calculation, press the green tick button to toggle through the available calculations.



Other Functions

Head Information

Press Menu. Scroll down to Info. Select Head and press Enter to display information about the head including type and last factory and user calibration date.

Product Information

Press Menu and scroll down to Info. Select Instrument and press Enter. Product Information is displayed including model, software version and last factory and user calibration dates.



Menu Structure

Digital Display

Note that the Range can be quickly set by pressing the up/down buttons.

Press MENU	Range	AUTO 10 μ W 100 μ W 1mW 10mW 100mW 1W	(Example ranges for diode head in digital display mode)
	Wavelength	Type in wavelength	
	Measure Mode	Average Peak	
	Auto-Calc	Pulse Width PRF Pulse Power	
	Zero	Set zero light level?	
	Display	Backlight Contrast	Use up/down buttons to set backlight brightness Use up/down buttons to set contrast
	Head Info		
	Info		

Graphical Display

Note that the X and Y scales can be quickly set by pressing the left/right and up/down buttons.

Press MENU	Y Scale per division	1 μ W 2 μ W 5 μ W 10 μ W 20 μ W 50 μ W 100 μ W 200 μ W 500 μ W	(Example ranges for diode head in graphical display mode)
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	1mW	
	2mW	
	5mW	
	10mW	
	20mW	
	50mW	
	100mW	
	200mW	
X Scale per division	60s	
	30s	
	10s	
	5s	
	2s	
	1s	
	500ms	
	200ms	
	100ms	
	50ms	
	20ms	
	10ms	
	5ms	
	2ms	
	1ms	
	500µs	
	200µs	
	100µs	
	50µs	
	20µs	
	10µs	
Trig Level	Use up/down buttons to change trigger level	
Trig Slope	Positive	
	Negative	
Trig Mode	Auto	
	Normal	
	Manual	
Cursors	On/Off	Use Enter button to select and left/right to move
	Δt	
	1/t	
	Δy	
Wavelength	Type in wavelength	
Zero	Set zero light level?	



Display	Backlight Contrast	Use up/down buttons to set backlight brightness Use up/down buttons to set contrast
Head Info	Displays Head Information	
Info	Displays Unit Information	

Connecting the ADM-1000 to a P.C.

The ADM-1000 can be connected to a P.C. using the supplied USB lead. The software and drivers are compatible with Windows XP.

If the ADM-1000 is connected to a high-power USB port (such as one on the back of a P.C.) the meter is able to draw it's power from the USB port and no other power source is necessary. In this instance the meter will turn itself on as soon as it is connected and installed on the P.C.

If the ADM-1000 is connected to a low power port such as a USB hub which has no power supply of it's own, or a long USB lead is used, the meter will need batteries or a power adaptor. In this instance, once the meter has been connected and installed as described below, it will need to be turned on and off manually as normal.

To connect the meter to the P.C., plug the supplied USB lead into the power meter and a spare USB port.

The P.C. should enter the Found New Hardware wizard. If the P.C. asks to look for drivers on the internet, select 'Not this time'.

Insert the supplied CD into the P.C.'s CD drive. When the P.C. asks if you want to install the software automatically, select the 'Install from a specific location' option.

At the next window, instruct the Wizard to search the CD drive.

The USB drivers are installed first, then the installation process repeats to install the Laser Power Meter drivers. On both occasions the wizard should be instructed to search the CD drive for the drivers.

On completion the power meter should switch itself on.